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NOTES FROM PACIFIC COAST OBSERVATORIES

THE RELATIVE SURFACE INTENSITY OF THE COMPONENTS OF ECLIPSING VARIABLES

The interesting discussion in the June number of these PUBLICATIONS on the relations between the surface intensity, the density and the mass of the components of the binary star *Sirius* by Director Campbell raises a question which had already been noticed and commented on by me in the "Spectroscopic Orbit of the Eclipsing Variable U Coronae," which is about to be published.

As is well known, when a reliable photometric orbit of this class of stars is available and when the spectra of both components are measurable, we can obtain not only the mass of the two bodies and the dimensions of the orbit but also their diameters, densities and surface intensities.

On examining the photometric orbits in Shapley's list[1] several stars will be found in which there is a considerable disparity in the diameters of the two components and in many cases very great differences in their surface intensities but it is only when both spectra have been observed that we can compare the surface intensity and spectral type of the components. In the variables *β Lyrae*, u *Herculis* and Z *Herculis* both spectra have been measured and the spectroscopic orbits determined. While these three stars each show distinctly that a similar or nearly similar spectral type is associated with considerably different surface intensity, I will nevertheless confine myself in this note to two variables whose spectroscopic orbits have been determined here.

Two separate determinations of the photometric orbit of RS *Vulpeculae* by Shapley[1] and Stewart[2] differ greatly tho agreeing in assigning greatly differing brightness per unit area or, as it is called here, surface intensity to the two components. The later orbit by Stewart, as presumably based on more accurate photometric observations, has been used. According to this and the spectroscopic orbit[3] the fainter component has five times the diameter of the brighter but only one four-hundredth the density. The surface intensity of the fainter is only one twenty-eighth that of the brighter while the spectral type is nearly the same, the primary being about B8 and the secondary B9.

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[1] *Contributions from Princeton Observatory, No. 3.*

[2] *Ap. Jour.* **42**, 315.

[3] *Jour. R. A. S. C.* **14**, 1.

While the secondary minimum was not observed in U *Coronae*, the spectroscopic observations show the spectrum of the second component, both being of the same type B5. Consequently the fourth of Shapley's orbits which assumes the brighter star as giving seventy-four per cent of the light of the system was taken as the most likely, altho little difference in the results, except to increase the ratio of surface intensities, would be given by using any of the other orbits. The fainter star has sixty per cent greater radius, a density one-twelfth and a surface intensity only about one-eighth that of the brighter, while the spectral types are the same.

While it is desirable to have more accurate photometric observations and orbits of these two stars, there can be no reasonable doubt of the substantial accuracy of the relative surface intensities and densities of the components. From these two cases and from those of other eclipsing variables, it would appear as if the surface intensity was not solely a function of the spectral type but had also some relation to the density. In eclipsing variables the star of smaller density has also the smaller surface intensity while in the visual binary *Sirius*, whatever reasonable assumptions are made of the value of the density and surface intensity, the fainter component of lower brightness per unit area must have the higher density. While it is true that the conditions in eclipsing variables and visual binaries are very different and while it is possible these systems may have had a different origin and mode of development, it is evident that, until more information is available, considerable caution must be used in assuming that the surface intensity of two stars of the same spectral type is the same.

J. S. Plaskett.

The Nebulous Disk Surrounding Nova Aquilae, No. 3

In an earlier note[1] I described *Nova Aquilae*, No. 3, as it appeared in the 36-inch telescope in August-September, 1919, and gave measures of the diameter (2″.37) of the nebulous disk[2] which surrounded the nucleus. At that time I called attention to the apparent increase in the size of this disk in the interval since October, 1918, when Barnard's measures gave a diameter of 0″.65.

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[1] *Publ. A. S. P.*, **31**, 283, 1919.

[2] The term *disk* in this note is used to describe the image of the nova, which is in focus when the eye-piece is drawn out 8 mm. beyond the normal stellar focus. According to Keeler's color-curve of the 36-inch lens, light of wavelength λ 4980 is brought into focus at this point. The N_1 and N_2 lines of nebulium have wavelengths λ 5007 and λ 4959 respectively.